DESIGN AND FABRICATION OF

CASHEW NUT DESHELLING MACHINE

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BACHELOR OF ENGINEERING

IN

MECHANICAL ENGINEERING

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Introduction

Cashew (Anacardium Occidentale L.) nut, which is derived from South American countries (Bolivia, Brazil and Peru), is an extremely important tropical fruit crop. Cashew fruit consists of an apple that bears fruit in which the kernel is embedded. It is mainly made up of kernel and shell. The kernel of the cashew nut is high in oil and protein content.

The project aims to design and fabricate a cost-efficient cashew deshelling machine that can be utilized by the small-scale industries that are involved in the Cashew processing. The conventional machine has a high cost and not feasible for small industries. India is the largest producer, processor, exporter, importer and second largest consumer of cashew in the world. De-shelling is the important post-harvest operation, which is a necessary step toward making the cashew nut ready for further utilization and also its shells are used further for oil extraction.

Objectives

The Design and Fabrication of a Cashew De-shelling Machine using Pneumatics. The primary objective is to obtain a higher number of strokes and a faster operation of the entire process. This is done to obtain a higher yield rate of cashew kernels in a short time span. The cost of the fabricated machine would be less than the conventional machine. This makes the operations to be performed by using compressed air. The higher deshelling rate with the new design would improve the economy of small-scale cashew industry and elevate the productivity of the industry. The comparison on the efficiency of the designed machine with the existing design is also carried out to test the deshelling rate. This also includes the performance test of the fabricated design. The output and shelling rate would be also tested.

Methodology

The pneumatic system uses the compressed air to reciprocate the cutting arm in the vertical direction. The blade is an elliptical profile with a slot at one side. The splitter is made with a one edge that forks out into two edges. This helps to split the cashew shells. Considering drawback of manual de-shelling methods, automatic de-shelling machine was developed. Most
of the existing de-shelling machines have a reciprocating mechanism, which involves sliding surfaces. The fabricated cashew nut de-shelling machine, is designed that operates on pneumatics. It consists of parts like frame, de-shelling slots, cylinder. Piston rod is used to push the cashew nuts into the slots where blades and splitter will complete de-shelling. The roller valves help to make the process mechanized and automated. The pilot valve is used to reverse the direction of the of the travelling piston.

The cylinder size was calculated to be 40mm and the stroke length needed is 280 mm. The operating pressure range is 3bar to 7bar. This is to compensate for the various sizes of the cashews and also the increasing the rate of the deshelling. The cutting force was taken to be 60kg for the operations. The stroke rate was determined to be 88 per minute at 5.5 bar pressure. The maximum safe operating pressure is 10bar

![Diagram of cashew nut de-shelling machine](image)

**Fig: Side view**

**Result and Conclusion**

The tests carried out concluded that the objective was met and the number of strokes per minute of the fabricated machine is 88 at 5.5 bar pressure. The number strokes increase linearly with the increase in operating pressure. So, a higher operating pressure would lead to a faster operation rate and vice-versa. Volume of compressed air consumed is 0.67 liters per stroke at 5.5 bar pressure. The deshelling efficiency is obtained at 84.8 % for 5.5 bar pressure. This was calculated on the basis of number of cashews fed to the machine and the number cashews that
were deshelled. The whole kernel efficiency was obtained at 76% at 5.5 bar pressure. This was calculated on the basis of cashew nuts fed to the machine and the whole kernel obtained by the deshelling process. The fabricated machine is powered by pneumatics and it will not have any electrical connections. The electrical energy will be needed only to run the compressor and maintain constant pressure.

**Scope for Future Work**

The completed machine will be powered by pneumatics and the spent compressed air could be regenerated and used for the de-husking of the cashew nuts. The whole kernel efficiency obtained by this method could be increased by increasing the number of blades and guideways. This would be helpful to obtain a higher yield rate and thus higher financial benefits. Increasing the Reservoir capacity would allow for the deshelling operations to take place even during a power outage.